

Epiwork

FP7 project 231807

Developing the framework for an epidemic forecasting structure

Kick-off meeting

Minutes of the contractor presentations

The kick off meeting held at the Villa Gualino, ISI, Torino on 3 to 4 February, 2009.

Present: David BREE, Dirk BROCKMAN, Jacopo CARRERAS, Flavio COELHO, Vittoria COLIZZA, Mario DA SILVA, Fabricio DA SILVA, Philip GERRISH, Shlomo HAVLIN, Frank HILKER, Haggay KATRIEL, Piet MAES, Stefano MERLER, Daniele MIORANDI, Olof NYREN, Enza PALAZZO (for day 1), Roberto PALERMO, Daniela PAOLOTTI, José-Javier RAMASCO, Moa REHN, Ronald SMALLENBURG, Nico STOLLENWERK, Lewis STONE, Alessandro VESPIGNANI in the chair

Absent with apologies: John EDMUNDS, Gabriela GOMES

0915 4 February: Re-opening

These are minutes of the presentations made by each contractor during the morning of 4 February, rearranged in order for WP. Slides are available for some of the presentations and will be attached to these minutes.

WP 1: Population models and contact networks

Nico Stollenwerk: CMAF, Lisbon (with slides)

Presented past work on multi-strain model applied to two studies:

- Dengue: two types of strains, dangerous and not. Deterministic chaos model data from Thailand, smooth for Thailand, but noisy for Bangkok; in comparison with UK, origin is in Bangkok, spreads North; but evidence is that it spreads South
- Meningitis: several strains, theory of accidental pathogens
- Influenza: daily data for 2007 in NL, hi fluctuations so fitted to cumulative curve: Poisson until epidemic started and then Binomial
- Influenza: data from Israel and from France (weekly data)

Frank Hilker

Interested in vector born diseases Disease ecology

Philip Gerrish

Interested in evolutionary genetics: what are the mechanisms responsible for large evolutionary changes?

Collecting data from different countries, which encourages other countries to supply their data. WHO also has data, but it is difficult to access. Vaccine development centres, eg in Cuba for dengue, in Canada for meningitis.

Lewis Stone: TAU

Has very detailed data on influenza, but doesn't know what to do with it!

However, this data is not available to the group as it is. It is not even clear to what extent it can be used in their group. Maybe it can be anonymized and then made available. WP4 have a model so hope that we can apply this to our data.

We make models of spread of epidemics in order to predict time and extent of epidemic. We are getting some counter intuitive results. Also seasonality has an effect. With childhood diseases there is an effect from one season to the next.

We also study contact networks. We will coordinate with the UK group (LHSHTM: not presented – snow grounded). the Swedish group (SMI) and Bar-Ilan (BIU).

We have two PhD students working on the data set and a post doc working on contact networks.

Shlomo Havlin: BIU [Slides]

Interested in advancing our understanding of networks:

- Now contact networks are available, but geographic information is also important. So need to combine the two.
- Dynamic networks, since contacts change over time
- Limited path length, e.g. for seasonal epidemics

This aspect is related to:

- WP1 Theme 3: effective intervention strategies
- WP2 Theme1: spatially structured networks
- WP3 Tasks 1 & 4: data driven simulation

Immunization strategies: locate hubs and immunize these. But we don't know the network. New strategy: ask a sample to name their friends. Hubs are those chosen by at least N . Even for $N=1$ this reduces drastically the number of people that need to be immunized. A Gaussian model makes predictions of the effectiveness.

Limited Path percolation: models tell us how many need to be immunized.

Which strategy to use? Compared three methods: random, hub targeted as above, graph partitioning. Graph partitioning divides the graph into groups of a size less than a given maximum. It is effective for minimising the number of people at risk of infection. But it requires knowing the network!

Climate networks: world model with temperature at nodes in say 4 networks. Used to study the effect of El Nino

Flavio Coelho: IGC

Studying three topics:

- modelling,
- forecasting techniques,
- extending the infrastructure for influenza & dengue fever surveillance to Brazil

Approach to spread of epidemics: use a simple math model and replicate, parameterise from the available data, using Bayesian melding (integrating different sources of data) techniques. Use the data to give probability distribution around the parameter values for the past, but also variables in the future (prediction).

Forecasting: parameters do not stay the same over time, eg temperature/behaviour changes. Example: take the first week of data and get the

probability distribution for both variables and parameters; use these as priors for the second week etc. Done with simulated data, but real data is patchy and noisy.

Collecting data: developing software for uploading data from different sources.

Gabriela Gomes: IGC (not present)

She is continue her work on population dynamics of multi stain disease, especially strain evolution

Comments from Vespignani:

- Please avoid reinventing the wheel; make good use of material from other partners. Please pay attention to what is in the project contract, e.g. dengue fever, while interesting, is quite secondary in the project contract. Work on such topics needs to be motivated to be included.
- We are getting €5M not just to do what we were doing before, but to benefit from the presence of the others in the partnerships. E.g. we need to establish a common method for recording and modelling influenza.

ACTION: ALL please contact others working in the same area.

WP2 Spatially structured models and human mobility

Dirk Brockman: MaxPlanck, Gottingen (Now at North Western) [slides]

Showed several movies displaying network dynamics:

- air travel density,
- viewing the network from different points of view
- proxy networks, geocaching: objects travelling from place to place, based on games over the internet, show international connections
- iWhere: new smart phones have GPS availability, which can be monitored.
- Computing effective boundaries that go beyond the political boundaries.

WP 2 objectives

- Compilation & standardisation
- Proxy networks
- Stability
- Multiscale communities, going beyond administrative boundaries
- There is a relation between contact and transportation networks: how to combine these?
- Connecting clients that everyone uses to large data bases, e.g. money flow & google earth.

Stefano Merler: FBK [slides]

Involved in several projects including the Italian based model of influenza, extended to a European model using social networks and long distance travel. Run on standard machines.

Contributions to Epiwork:

- WP4 data driven simulations of case studies, modelling platform, visualisation of results.
- WP2 dynamics of heterogeneous networks, super-spreading phenomena

- WP3 data collection

WP3 Information platform

Mário da Silva: University of Lisbon [slides]

Epiwork team: Mário da Silva, Fabrício da Silva, Farancisco Couto, Luís Filipe Lopes and a new software engineer.

Will develop an Epidemic Marketplace:

- Catalogue of available epidemic data sources
- Forum for publications
- Host of mediating software

Deliverables for WP3:

3.1 report on meta model spec

ACTION: ALL we need your data and your input

3.2 prototype of epidemic market place (Month 12)

3.3 release of epidemic market place

3.4 report on epidemic market place

3.5 report on epidemic data ontology

3.6 report on final spec and evaluation of epidemic marketplace platform

Inspire directive. A question from Brussels: why are we not linked to this directive on GIS? Maybe because we are not interested in the details of the GIS people, eg on which GPS datum to use.

WP 4 Epidemic modelling platform

Alessandro Vespignani: ISI [Slides]

Developing the Global Epidemic Modeler (GEM) which uses a coarse grain tessellation of the world. It uses many different data sources on transportation infrastructure, e.g. IATA airline data, country mobility data from different countries.

Link with WP 1 for a computational model of epidemic diffusion; also for how to cut the network to delay the spread of infection.

There is a potential problem of resolution: how does GEM compare with country models

How to interface with the data sharing platform? Can GEM use this platform directly.

WP 5: ICT monitoring and reporting system

Ronald Smallenburg: Acquisto Inter BV, Amsterdam

Uses

- interaction observed on the www, as done in the NL, extension to other EU countries planned
- uses mobile phones, starting in Italy.

First step is to collect data in old EU countries and then the new EU countries

Daniela Paolitti: ISI [slides]

Has ported the Portuguese influenza platform to Italy, which posed several problems.

Three problems:

- Does the data to be stored comply with the national regulations?
- Recruiting people to participate, using various media: word of mouth TV, WWW, Radio, newspapers . What makes a difference is WWW and TV. Now have about 4,000 participants.
- Ensuring participation: weekly reminder, roughly half of the participants are still active

What's new: users can now view of state of flu at any one time, by zipcode.

Olof Nyren: Stockholm

Is self selection a strong factor influencing illness instances and in their reporting? We will try to validate the NL data in Sweden. Prerequisites are unusually good in Sweden, where there are many updated registers.

Done by drawing a random sample from the population, i.e. Stockholm, and inviting to participate by reporting common sickness for one season. Acceptance rate is around 30%. We believe that this is a representative sample. Participants call us when they have something to report (validated by questionnaires on a sub sample). We have a questionnaire on the background information on the participants taken at their initial registration. We have data for two years but are still reluctant to use them because of the validity issue.

We are keen to interact and collaborate with others on standardising the questionnaire and data collection method. We have three reporting systems and will compare the results: doctors, our telephone based and national recording.

ACTION: ALL Common format for data sharing is needed.

Piet Maes: KU Leuven

Works in a virology lab. Interested in the linkage between genes and viruses.

Daniele Miorandi: CREATE-NET [slides]

Also involved are:

- Iacop Carreras for technical activities
- Andrea Zanardi & Antonio Francescon, software development

Active in WP 5, Task 5.7 & 5.8

Activities:

- Extend IMS platform to mobile forms
- Tracing contacts using mobile phones (Bluetooth)

Expected results:

- Beta version of mobile phone interface by the first review meeting
- Demo for first review meeting

A thought - From InluNet to InluBook:

Develop a facebook application to compliment IMS. Facebook is a widely used platform, so does not require spreading a new application.